Skyranger Operators Manual

G_____ Serial No.: BMAA/HB/_ _ _

Approving Authority

British Microlight Aircraft Association
The Bullring, Deddington, Banbury
Oxon, OX15 0TT, United Kingdom
by delegation from the United Kingdom Civil Aviation Authority

Manufacturer

Design rights are owned by Best Off – France. Manufactured under licence by Aeros – Ukraine.

Importer

Aircraft Kits and Spares are imported by:
Skyranger UK Ltd

This manual is a legal document which is approved for use with Skyranger microlight aircraft issued with a United Kingdom Homebuilt Permit to Fly. It must remain with the aircraft, and not be amended or altered without authority from either the BMAA or UK CAA.

All pilots should read this manual before flying as pilot in command of the aircraft to which it refers.

Approved for issue:-

G B Gratton
Chief Technical Officer
British Microlight Aircraft Association

P M Dewhurst
Project Test Pilot

Contents

1. Introduction 4
2. Description of the Aircraft 5
3. Limitations 6
4. Flying the Skyranger 9
5. Performance 22
6. Emergencies 24
7. Rigging and De-rigging 26
8. Weight and Balance 27
9. Routine Maintenance 28
10. Repairs 31
11. Vital Statistics 33

Annex A The Microlight Airworthiness Approval Note recommending issue of a permit to fly

Annex B Engine Manual

Annex C Maintenance schedule MMS-1

Annex D Weight and balance report for this aircraft (form BMAA/AW/028).

Annex E Minor modifications fitted to this aircraft (MinMods)

Annex F Major modifications fitted to this aircraft (MAANs)

Annex G Instructions and Manuals for other devices fitted to this aircraft

TABLE OF AMENDMENTS

Amendment No	Date incorporated	Signed

1. Introduction

1.1 The Skyranger is a three-axis microlight aeroplane, it was certified in the United Kingdom to the requirements of British Civil Airworthiness Requirements (BCAR) Section S issue 2; which at the time of writing is arguably the highest airworthiness standard in the world which is applied to microlight aircraft.

1.2 This manual is not intended to teach you to fly the aircraft, or to build it. Learning to fly should be accomplished under the supervision of a light aircraft or microlight flying instructor experienced on the type; at time of writing it is legal to learn to fly on a Skyranger so long as you are the sole owner of the aircraft (or spouse). A separate build manual exists to instruct you in building a Skyranger from a kit.

1.3 What this manual will do, is provide the information which a qualified pilot requires to safely fly this aircraft (although a conversion by an instructor, familiar with the type is recommended), and to carry out routine maintenance and minor repairs. Manuals exist for this aircraft for use overseas which also include guidance on fitting modifications to the Skyranger; all modifications to a British Skyranger must be approved by either the British Microlight Aircraft Association, or the UK Civil Aviation Authority. In general, the BMAA offers the cheapest and most straightforward route for approving modifications.

1.4 The licenses which would be required to fly this aircraft are a UK PPL(Aeroplanes)-Microlights, with or without operating restrictions. Because microlight aircraft have flying characteristics that can differ in many areas from heavier types, a UK or JAA PPL(Aeroplanes), BCPL(Aeroplanes), CPL(Aeroplanes) or ATPL(Aeroplanes) is only acceptable if they contain a valid Microlight rating. This rating can be obtained after suitable conversion training is undertaken by a microlight FI and a General Flying Test is completed to a satisfactory standard with a microlight X Examiner.

1.5 This aircraft must be operated using two separate logbooks. One for the airframe and one for the engine (or the BMAA combined logbook, reference BMAA/AW/036). All entries must be made in the logbook in ink and within 7 days. If the aircraft is fitted with an in-flight adjustable propeller, a separate logbook must also be held for that; it is recommended that CAP400, which is issued by the CAA and available from most pilot shops is used for this purpose.

2. Description of the Aircraft

2.1 Ancestry. The Skyranger was conceived by Philippe Prevot of Best Off Manufacturing, France, in 1991. The first 200 examples were manufactured under licence by Synairgie between 1994 and 1998. The manufacture of the Skyranger was moved to Aeros in the Ukraine in 1998, incorporating many developments in the design.

2.2 Construction. The Skyranger is predominately constructed of pin-jointed straight aluminium tubes covered with pre-sewn polyester fabric.

2.3 Flying Controls.

2.3.1 Pitch control is effected by fore-aft movement of the central stick, with movement transmitted to a conventional elevator through cables.

2.3.2 Pitch trimming is effected by a hand-operated lever mounted above the starboard seating position, with movement transmitted through cables to a trim-tab on the starboard elevator.

2.3.3 Roll control is effected by sideward movement of the central stick, with movement transmitted through cables to part-span, differential-movement ailerons.

2.3.4 Yaw control is effected by dual-control foot pedals, with movement to the rudder transmitted through cables.

2.3.5 Braking is effected by hand-operated hydraulic disc brakes.

2.3.6 The undercarriage is of tricycle arrangement, with nosewheel steering effected by movement of the dual-control rudder pedals.

2.3.7 Flaps are lowered in two stages by lifting a hand-operated lever located between the seats whilst gripping an integral latching lever.

3. Limitations

3.1 **Introduction**.

This section includes the basic operating limitations for the Skyranger. The full limitations are contained in Homebuilt Aircraft Data Sheet (HADS) HM4, which is used by the Inspector at Annual Permit renewal to ensure, amongst other things, that the correct limitations are placarded in the cockpit.

3.2 **Units.**

When noting limitations, it is important to ensure that the limitations which you are using use the same units and calibrations as the instruments in the cockpit. The limitations shown below use knots CAS (Calibrated Airspeed); your aircraft may have an instrument in mph, and in any case will read IAS (Indicated Airspeed). The difference between IAS and CAS is basically the accuracy of your Pitot-static system. The IAS limits for your aircraft were determined when the aircraft was test flown, and are shown in Annex A to this manual. There will also be a placard in the cockpit, however space is allowed below for you to insert the IAS limitations and calibration details for your aircraft.

IAS Calibration Card for Skyranger G-_____.

Kn CAS (Calibrated)	33 Vso	36 VS1	40	50 min sink	53 climb	55 approach speed	60 Best Glide	65	71 Vfe	72 Va	80	90	100	108 Vne
IAS (Indicated)														

Unless all errors are less than 2 knots, a copy of this calibration card must be displayed in the cockpit near to the ASI.

3.3 **Operational Limitations.**

3.3.1 The Skyranger must only be flown in day VMC conditions, with sight of the surface. It may not be flown over built up areas.

3.3.2 The Skyranger is certified to a "permit to fly" standard. This prohibits aerial work, other than flying instruction of the owner, or flight testing of the aircraft for initial approval, or approval of subsequent modifications.

3.3.3 This aircraft is certified to a UK only standard, this means that permission is required from the host country to fly it overseas. However a reciprocal agreement for homebuilt aircraft means that no permission is required for flights to other ECAC (European Civil Aviation Conference) member states.

3.3.4 For flight the following instruments must be fitted and serviceable:

ASI, Altimeter, Slip, RPM, Compass, Water or Cylinder Head Temperature, Oil Temperature, Oil Pressure.

3.3.5 It is recommended that the Skyranger is not flown where a crosswind component above 15 knots is predicted.

3.3.6 Do not fly above 10,000ft standard pressure altitude without the use of personal oxygen.

3.4 **Flight Limitations and key performance speeds**

3.4.1 Never exceed speed, Vne, is 108 kn CAS [IAS]

3.4.2 Manoeuvring speed, Va is 72 kn CAS [IAS]

3.4.3 Flap limiting speed, Vfe is 71 kn CAS [IAS]

3.4.4 Door open limit speed is 71 kn CAS [IAS]

3.4.5 Speed for best rate of climb 53kn CAS [IAS]

3.4.6 Speed for best climb angle 45kn CAS [IAS]

3.4.7 Maximum Bank angles are 60° either way.

3.4.8 Maximum Pitch attitudes are 45^0 nose up and down from the horizontal

3.4.9 Normal acceleration limits are +4g / -2g.

3.4.10 At least 55kg (121lb / 8 stone 9lb) must be in the cockpit for flight, no more than 90kg (198lb / 14stone 2lb) may be carried in each seat.

3.4.11 Maximum Take-off weight is 450kg.

3.4.12 Aerobatics and deliberate spinning are prohibited.

3.5 **Engine Limitations**

The limitations for the engine are contained in Annex B, they are also placarded in the cockpit.

4. Flying the Skyranger

4.1 **Pre-Flight Inspection.**

4.1.1 **Engine.**

Carry out an engine pre-flight inspection following the instructions contained in the Engine Manual at Annex B.

4.1.2 **Aircraft.**

The following is a brief summary of the minimum pre-flight inspection, if you are unsure, it does no harm to increase the number of items on your inspection.

Inside the Cockpit

- Ignition switches OFF
- Condition of choke and choke cable
- Condition and security of all flying controls.
- Check condition of all instruments
- Check harnesses are properly fitted and not frayed.
- Check seats are secure.
- Check fuel filter is clean.
- Check sufficient fuel for the planned flight.
- Check wing leading and trailing edge bolts secure

Underside

- If the aircraft has not flown within 24 hrs, drain a small amount of fuel from the drain tap using a standard tool and check for water.

Engine

- Remove the upper cowling
- Check oil level and condition in oil tank
- Check water level

- Check security of engine mounts
- Check security of spark plug caps and leads
- Check security of water and oil hoses and connections
- Check security of electrical connections
- Check prop bolts protruding from securing nuts
- Generally look for any fluid leaks or loose fastenings
- Replace the cowling and all securing screws

Starting from the nose, inspect:

- Condition of the propeller: no nicks or cracks
- Condition and security of the spinner, if fitted
- Condition and inflation of the nose wheel tyre
- Security of the nose wheel spat and fairing
- Security of the engine cowling

Moving down the starboard side of the aircraft and along the starboard wing, inspect:

- Static vent is clear of obstructions
- Condition of door, hinges and latches
- Starboard undercarriage leg undistorted
- Tyre condition and pressure
- Security of wheel spat
- Check for evidence of hydraulic leaks
- Security of wing strut lower attachment bolt
- Jury strut brackets
- Wing struts and jury struts straight
- Through the inspection panel in the lower surface, check that the wing strut forward upper attachment is secure and the condition of the aileron pulleys and cables
- General condition of leading edge and covering
- Aileron movement and hinges, attachment of cables and control horn condition
- Flap, hinges, and security of actuating rod attachment

- Condition of wing covering and security of battens

Moving towards the tail, inspect:

- Condition of covering on tail cone.
- Security of horizontal tail mounting bolts and covering lacing
- Elevator and hinges, horns and cables
- Trim-tab, horn and cables
- Rudder and hinges, horns and cables
- Condition of tail surface coverings
- General alignment of vertical and horizontal tail surfaces
- Condition of bracing wires and their terminations

Moving forwards to the port wing, inspect:

- Port undercarriage leg undistorted
- Tyre condition and pressure
- Security of wheel spat
- Check for evidence of hydraulic leaks
- Security of wing strut lower attachment bolt
- Jury strut brackets
- Wing struts and jury struts straight
- Condition of wing covering and security of battens
- Flap, hinges, and security of actuating rod attachment
- Aileron movement and hinges, attachment of cables and control horn condition
- Through the inspection panel in the lower surface, check that the wing strut forward upper attachment is secure and the condition of the aileron pulleys and cables
- General condition of leading edge and covering
- Condition of door, hinges and latches
- Static vent is clear of obstructions
- Finally, stand back and assess the overall symmetry of the aircraft.

4.2 **Starting.**

4.2.1 Before starting the engine ensure that the max takeoff weight will not be exceeded (from fuel/weight placard).

4.2.2 The BMAA standard manual pre-start checks [STAIP] are recommended. The actual starting procedures for a particular engine are contained in Annex B to this manual. The STAIP checks are :-

Security	Aircraft, Crew, Equipment, Secure, brakes ON.
Throttles	full and free, and closed, choke set as required.
Area	all around and behind aircraft clear.
Ignition	mags ON.
Prop	Shout 'clear prop', pause then start the engine.

Once the engine is running set the recommended warm up RPM and slowly remove the choke.

4.3 **Taxiing.**

4.3.1 Before taxiing ensure that the engine has run for at least 2 minutes from cold. Do not use high RPM until the engine has reached its minimum flight operating temps.

4.3.2 Taxy at no more than a brisk walking pace, somewhat less if the surface is rough. Steering is effected through the rudder pedals which are linked directly to the nosewheel. The turning circle normally is around 20 feet in diameter (at the aircraft centreline).

4.3.3 Microlight aircraft are easily blown over in winds over 25knots. It is imperative that when taxiing in strong winds the correct control placements are used. When the wind is from the forward quarters hold the stick into wind and the elevator neutral. When the wind is from the rear quarters the stick should be positioned away from the wind and the elevator held down.

4.3.4 **Taxy checks**

When taxying check:

- Brakes functioning
- Compass moving when aircraft turned
- Slip ball moving when aircraft turned
- Engine temps warming, no limits exceeded

4.4 **Take-off.**

Prior to take-off, it is recommended that the following pre takeoff check is used. This check is a derivation of the mnemonic CHIFTWA as used in many BMAA schools.

- Position the aircraft into wind, brakes held on
- Set recommended warm up RPM
- **C - Controls**
- Check controls for full and free movement (Note, a knee board worn on the pilots right leg may give control restriction)
- Check visually that the controls are moving in the correct sense
- **H - Harness and Hatches**
- Check harnesses and hatches are secure, no loose objects
- **I – Instruments and engine**
- Check flight instruments are set and serviceable
- Check engine instruments are servicable, minimum operating temps
- Check choke is OFF
- Set recommended RPM and check mag drop
- Check for smooth idle
- Increase power to maximum that the brakes will hold for at least 10 secs
- Check engine indications normal
- Reset recommended smooth fast idle RPM
- **F – Fuel and Flaps**
- Check fuel tap is ON
- Check contents sufficient for flight

- Cycle flaps and check symmetrical operation, detent operation
- Set flap as required
- **T - Trim**
- Check trim set for takeoff
- **W – Wind (and emergencies)**
- Check wind speed and direction
- Consider emergency actions
- **A – All clear**
- Confirm all clear on approach
- R/T call if required and line up on runway

4.5 Take-off

4.6 Normal

4.6.1 For a non performance takeoff, into wind, flaps can either be left in the fully up –CR (cruise) position, or with the first stage – TO (takeoff) position.

4.6.2 When lined up and rolling straight smoothly apply full power. Keep straight with rudder, ailerons neutral and with the elevator slightly up to reduce the weight on the nosewheel.

4.6.3 When the airspeed rises to 45 knots CAS [IAS] rotate and lift off and adopt a shallow climb attitude. Allow the airspeed to rise to 60 knots CAS [IAS] and adopt a climbing attitude to hold this airspeed.

4.6.4 When above 200 feet AGL the airspeed can be reduced to 53 knots CAS [IAS] if a greater climb rate is required, and the flaps selected to CR. The power can also be reduced a little for noise abatement if required. When the flaps are retracted there will be a slight tendency for the aircraft to pitch up, which will require a gentle push on the stick to maintain a constant airspeed. Therefore after the flap change re trimming may be required.

4.6.5 When in the climb, due to the excellent climb rate the nose is high and may obscure forwards view. Therefore it is recommended to periodically weave or lower the nose to clear the blind spot. For prolonged ascents a cruise climb at reduced power setting and slightly higher airspeed is recommended and will increase forwards field of view.

4.7 **Short takeoff**

4.7.1 For a short takeoff select first stage, (TO), flap. Start from as close to the beginning of the field as possible. Hold on the brakes as power is increased to full. When power is full or if the aircraft starts to 'creep' forwards, release the brakes. Elevator position should be neutral (smooth surfaces only!) or slightly up.

4.7.2 When the airspeed rises to 40 – 45 knots CAS [IAS] rotate and lift off. When airborne allow the aircraft to accelerate to 45 knots CAS [IAS] for best obstacle clearance. Be aware that at this speed prompt action will be needed to lower the nose and obtain glide speed in the event of power loss.

4.7.3 When clear of obstacles allow the aircraft to accelerate to 53 knots CAS [IAS], and at 200 feet AGL select CR flap.

4.7.4 It is important to always pick an abort point before attempting to take off from a short field. If the aircraft approaches the abort point before lifting the takeoff should be aborted by fully closing the throttle and braking firmly.

4.8 **Soft field takeoff**

4.8.1 Select first stage (TO) flap. Avoid stopping the aircraft whilst entering the runway and roll into the takeoff run. Hold full up elevator until the nosewheel lifts and then try to balance the aircraft in the rotate attitude whilst speed is increased. This will help reduce rolling resistance and keep overall drag to a minimum.

4.8.2 Allow the aircraft to lift off at around 40 knots CAS[IAS] , and then carefully allow the aircraft to accelerate to 53knots CAS [IAS] in ground effect before adopting the climbing attitude. At 200 feet AGL select CR flap.

4.9 **Crosswind takeoff**

4.9.1 The maximum demonstrated takeoff crosswind limit of the Skyranger is a component of 15knots. Pilots are advised to avoid crosswind components of greater than 10 knots until very experienced on the Skyranger.

4.9.2 Select O (CR) flap. Start the takeoff roll with the stick held fully into wind and the elevator neutral. Pressure may be required on the rudder pedals to steer straight.

4.9.3 Allow the aircraft to accelerate. The amount of aileron can be reduced if there is a tendency to lift the downwind wheel. Keep the elevator neutral until the speed reaches 53knots CAS[IAS], then cleanly rotate and lift off.

4.9.4 As the aircraft lifts off adopt a shallow climb attitude. Gently yaw the aircraft into wind to set up the required drift angle, and centralise the ailerons and centralise the balance ball.

4.10 **Landing**.

4.10 **Normal landing**

4.10.1 Generally the Skyranger should be landed from an approach speed of about 55knots CAS [IAS], although in turbulent conditions handling can be improved by increasing this by 5-10 knots. Full flap (LD) position should be selected. As flap is selected a gentle pull on the stick will be required to maintain constant airspeed. Therefore re trimming will be required.

4.10.2 Roundout should be initiated around 15-20 ft and hold-off 2-3 ft above the runway.

4.10.3 Pilots transitioning from more traditional lower performance microlight aircraft should be aware that if the airspeed is allowed to increase on the approach then the aircraft may exhibit considerable float during the hold off period and this may cause a tendency to 'balloon' and will cause more runway than expected to be used.

4.11 **Short field landing**

4.11.1 Select full flap (LD) position, and set up a powered approach at around 45 – 50 knots CAS[IAS]. Use power adjustments to control the flight path and rate of descent whilst accurately maintaining airspeed with elevator. If tall obstacles are present on the approach, then transition into a glide approach once clear past them. Take care however to maintain airspeed during this

phase. 50 knots CAS [IAS] is recommended as the minimum for a glide approach at max takeoff weight.

4.11.2 When round out height is reached close the throttle fully and round out. Perform a brief hold off and land. Brakes can be used to shorten the landing roll if required. Take care not to brake too sharply on rough or soft surfaces.

4.11.2 Accurate airspeed control is the key to short field performance and pilots new to the Skyranger must practice until this is achieved to be able to land in the published distance.

4.12 **Soft field landing**

4.12.1 Fly the approach as in 4.11.1 above.

4.12.2 Fully hold off and try to touch down gently and as slow as possible. During the ground roll avoid braking and progressively apply full up elevator to keep the nose wheel up for as long as possible. Continue to hold up elevator when the nose wheel is on the ground.

4.13 **Cross wind landing**

4.13.1 The Skyranger has a maximum demonstrated crosswind component of 15 knots. Cross wind components above 10 knots should not be attempted other than by experienced pilots fully familiar with the type.

4.13.2 Either O (CR) or first stage (TO) flap can be selected. Fly a powered approach at a little higher airspeed than normal – around 55 – 60 knots CAS[IAS]. Initially crab the approach to remain in balance and on centreline.

4.13.3 During the final stages of the approach lower the into wind wing a little and rudder the fuselage to align with the runway. Round out and hold off like this and touchdown into wind wheel first. Try to land after a short hold off without allowing the airspeed to decay too much. This will assist in maintaining good control response.

4.13.4 As with all crosswind landings the aircraft must still be accurately 'flown' whilst on the ground. Initially the aircraft will touchdown into wind main wheel first. Progressive aileron deflection should applied into wind as the speed decays during the ground roll to keep the aircraft on one wheel and gently

lower the downwind wheel as airspeed decays and aileron authority is reduced. The aircraft will need to be accurately steered straight down the runway with rudder during this process. The nose gear should be held off initially and gently lowered before rudder authority reduces too far and aerodynamic directional control is lost. As the nose wheel touches down rudder will have to be straightened to avoid a steering snatch due to the rudder deflection applied against the crosswind.

4.13.5 When the nose wheel is down aileron will still need to be applied against the crosswind and neutral or light forwards elevator pressure should be applied to ensure adequate steerage from the nose wheel and avoid yawing into wind.

4.14 **Cruise.**

The Skyranger has a large range of cruise speed. At the higher values fuel consumption will be correspondingly higher. Cruise is set up in the normal way by selecting the required attitude and power and trimming off any residual pitch forces.

4.15 **Turning.**

4.15.1 Turning the Skyranger is accomplished in the standard manner. In common with most microlight aircraft the Skyranger requires some rudder co ordination to maintain balance when rolling into and out of a turn.

4.15.2 As with any other aircraft, the stall speed will increase with bank angle. The stalling speed at 60^0 bank will rise to 51 knots CAS[IAS], at max takeoff weight.

4.16 **Flight in Turbulence.**

The Skyranger has powerful controls and handles turbulence well. However, do not fly above the manoeuvre speed of 72 knots CAS [IAS] in turbulence. Below this speed the worst thing a gust can do to you is stall the wing or one of the control surfaces. Above that speed, it is possible for strong gusts to overstress the aircraft.

4.17 **Stalling.**

During test flying of the UK prototype G-CBIV the following stalling speeds were recorded:

VS1 – Stalling speed at max takeoff weight, forward CG and flaps up: 36kn CAS.

VSO – Stalling speed at max takeoff weight, forward CG, full flap: 33kn CAS.

These speeds should represent the worse case in normal service. Lower takeoff weights and more rearward CG will lower the stalling speed – but not by much! Pilots should also remember that stalling speed increases during turns and manoeuvres. Any ice on the aircraft will also increase stalling speeds – **never takeoff with ice present on the aircraft.**

4.17.1 **Slow flight characteristics**

Slow flight indications include:

- Lightening of controls accompanied by reduced effectiveness
- Reduced airflow noise (most noticeable at low power settings)
- High nose attitude (most noticeable at high power settings)
- Rearwards position of control stick and back pressure
- Strong pitch buffet as the incipient stall is entered
- A tendency to roll or wing rock accompanying the buffet

To recover normal operating airspeed at the slow flight stage, simply move the stick forwards and apply power.

4.17.2 **Wings Level, Power Off.** The aircraft can safely be stalled at a deceleration rate of up to 3kn/s. Max pitch attitude is 45^0, and stall warning is given about 5 knots above the stall by buffet. Stall is normally marked by a mushing descent in heavy buffet or nose drop.

4.17.3 **Recovery** is effected in the standard manner by moving the stick forwards to reduce angle of attack and simultaneously applying full power. The nose can then be raised as soon as the airspeed is building past 45 – 50 knots CAS [IAS]. Height loss between stall and recovery, if well executed, is around 50 feet ft if power is used, or around 100 feet to establish a steady glide if power is not used.

4.17.4 **Wings Level, Power On.** Characteristics are similar to the power off case. An additional warning of the approaching stall is the attitude of the aircraft. With full power set the aircraft stalls at a very high nose attitude.

4.17.5 Because of the increased slipstream and torque effect at high power settings considerable rudder deflection may be required to keep in balance as the stall is approached. Stalling out of balance can result in considerable wing drop.

4.17.6 **Recovery** is simply effected by moving the stick forwards to reduce angle of attack. Any tendency to wing drop should be countered by application of opposite rudder sufficient to prevent further yaw towards the dropping wing. These two actions should be performed simultaneously.

4.17.7 **In Turning Flight.** Stalling speeds are increased with bank angle, in the manner normally expected. The Skyranger often has the characteristic of rolling towards wings level as the stall occurs. Recovery is standard. Move the stick forwards to reduce angle of attack and apply power. Simultaneous opposite rudder should be applied against any rolling tendency. Once the aircraft is safely above the stalling speed co-ordinated aileron and rudder can be used to level the wings.

4.18 **Aerobatics.** Aerobatics are not permitted in this aircraft.

4.19 **Departures from Controlled Flight.**

4.19.1 **The Spin.** Deliberate spinning of the Skyranger is prohibited. However, it is possible through mishandling of the aircraft to inadvertently enter a spin, either through stalling the aircraft in a turn, or by failing to keep the rudder pedals straight at the point of stall. Should this happen, the spin can be seen by a steep nose-down pitch attitude (about 45° nose down) and the aircraft rapidly yawing one way or the other. Some higher than normal 'g' forces may also be experienced. Should this occur, close the throttle and centralise the stick and rudder pedals immediately. The aircraft should stop turning almost immediately and be established in a steep nose down attitude with the airspeed rising rapidly. At this point gently ease out of the dive, and then normal flight can be resumed.

4.19.2 **Other Departures.** Other departures from controlled flight are likely either to be due to damage to the aircraft, or hazardous flying conditions. In either case, land as soon as possible and examine the aircraft, particularly the flying controls, for any damage.

4.20 **Flight with doors open**

If fitted with the two piece door option the Skyranger may be flown with the top half of the door open. The maximum speed for flight with the doors open is 71kn CAS [IAS].

4.20.1 When the doors are opened in flight they must be latched on the wing mounted hooks. Failure to do this can result in the door unexpectedly slamming shut during flight out of balance (sideslips).

4.20.2 Pilots should be aware that as the doors are opened the aircraft will experience a tendency to pitch up slightly and re establish trim some 5kn or so slower.

4.20.3 The Skyranger exhibits greater directional stability when flown with the doors open. This then requires slightly more rudder input to maintain balance with the engine running at full power in the climb.

4.20.4 Climb and glide performance is slightly reduced when flying with the doors open. Stall and spin characteristics remain unchanged.

5. Performance

5.1 The following data was obtained in the original UK prototype, G-CBIV. Changes from this data for your particular aircraft will be at Annex A. When using the data for planning purposes, apply sensible safety factors, such as are contained in CAA Safety Sense leaflet 7B (aircraft performance), part of which is reproduced here by kind permission of the CAA.

5.2 **The best climb speed** is 53kn CAS [IAS]. When selecting a climb speed, always remember that should anything go wrong, more speed gives you more time to sort your problems out. Although climb performance may change between aircraft, the best climb speed should not. Specific performance figures for your aircraft will be in Annex A.

5.3 **The best glide speed** is 60kn CAS [IAS], at which a glide ratio of around 9 to 1 may be expected. Flying a little slower at 50kn CAS [IAS] will give the minimum descent rate (min sink) of around 550FPM.

5.4 **Cruise performance** Because microlight aircraft are very strongly affected by weight, engine condition, propeller matching, wind and air temperature, it is very hard to give any reliable information concerning the cruise performance of the Skyranger. The captain is encouraged to plan very conservatively until sufficient experience is gained of the fuel consumption and cruising speeds at the conditions in which he or she normally fly the aircraft.

5.5 **Takeoff performance** Take-off performance for short dry grass for your aircraft is contained in Annex A.

5.5.1 Using the figures above, the following additional safety factors should be applied to the distance to clear a 15metre obstacle (taken from CAA GA Safety Sense leaflet 7B). If unsure, always use these factors to ensure you have sufficient take-off distance available.

Per 1000 ft runway height above Sea Level	Multiply by 1.1
Per 10°C increase in temperature above 15°C	Multiply by 1.1
Per 2% uphill slope	Multiply by 1.1
Soft ground or snow or wet grass	Multiply by 1.25
If it is very soft (or wet), or the snow is more than 1"deep	Multiply by 1.6
If you have to take-off with a tailwind	Multiply by 1.2 for every 4 knots of wind
Now to be sure, multiply by 1.33, to take into account that you may not fly the aeroplane as well as the company test pilot did when he worked out the values in the manual.	

5.6 **Landing performance** Landing performance for short dry grass for your aircraft are contained in Annex A. Using the figures above, the following additional safety factors should be applied to the distance to clear a 15metre obstacle on the approach (taken from CAA GA Safety Sense leaflet 7B). If unsure, always use these factors to ensure you have sufficient runway to avoid using the considerately provided hedge at the far end of the runway.

For every 1000ft you are above sea level	multiply by 1.05
For every 10^0C above 15^0C air temperature	multiply by 1.05
For every 2% of downslope	multiply by 1.1
If the runway is tarmac or concrete	multiply by 1.2
If the ground is soft, or there is snow or wet grass	multiply by 1.25
If the ground is very soft (or wet) or if the snow is more than 1" deep	multiply by 1.6
If you have to land with a tailwind	multiply by 1.2 for every 4 knots of wind
Now to be sure, multiply by 1.33, to take into account that you may not fly the aeroplane as well as the company test pilot did when he worked out the values in the manual.	

6. Emergencies

6.1 **Engine Failure Before Take-Off**. Close throttle, apply brake, switch off.

6.2 **Engine Failure After Take-Off (EFATO).** Lower nose, to establish an approach speed of at least 50 kn CAS [IAS] land straight ahead or near to straight ahead, DO NOT ATTEMPT TO TURN BACK from below 500ft.

6.3 **Engine Failure In Flight.** Lower nose, maintain 50 kn CAS [IAS] the minimum sinking speed. If it is required to glide a distance to the nearest suitable field then 60 kn CAS [IAS] will give the best glide speed, fly a little faster in a head wind to maximise distance and a little slower with a tail wind. Select a landing site, make emergency radio call if time permits, as time permits check for possible reasons for engine failure and attempt re-start (e.g. ignition switches, fuel cock, lack of fuel pressure), if field is flat land into wind, otherwise uphill. Apply braking only if it is essential to stop within the distance available, and never before all 3 wheels are on the ground.

6.4 **Engine Fire in Flight**. Close fuel cock, open throttle fully, make emergency call if time permits, when engine stops turn off mag switches and master, treat as engine failure in flight. Vacate aircraft as soon as possible after landing.

6.5 **Fire in the cockpit.** Close all ventilation, switch off all electrical devices (not the ignition unless there is an engine fire also), land immediately and vacate the aircraft.

6.6 **Emergency Landing on Water.** Try to land into wind with as high a nose-up attitude as possible. Before impact, pilot and passenger must be prepared to release their harnesses, it may also be beneficial to release the doors before impact. If wearing lifejackets, do not inflate them until outside the aircraft. Note that it is very hard to judge height above water.

6.7 **Emergency Landing in Trees.** Ensure harness(es) tight, try for low bushy trees as far as possible. Try to impact with as steep a nose-up attitude as possible.

6.8 **Inadvertent Flight in Hail or heavy rain**. Reduce power to avoid propeller damage, fly out of the weather as soon as possible.

6.9 **Inadvertent Flight in Icing Conditions.** Fly out of conditions as soon as possible, land as soon as possible.

6.10 **Use of Ballistic Parachute (if fitted).** Tighten harnesses, fuel cock OFF, ignition OFF, pull handle, make emergency radio call if radio carried. [Note, if a BRS is fitted to this aircraft, the BRS manual will be annexed to this manual.]

7. Rigging and De-rigging

7.1 **To attach the wings to the Skyranger:**

- With the wing tip raised to approximately the rigged height, slide the wing root into place to engage in the root brackets.
- Insert the wing root fixing bolts
- Attach the lift struts and jury struts
- Tighten all attachment bolts and insert safety rings
- Connect flap pushrod
- Connect Pitot line
- Connect aileron cables
- Ensure aileron cables are crossed as per placard in cockpit on central upright.
- Final inspection of all nuts and bolts, cable routing and attachments

7.2 **To remove the wings from the Skyranger:**

- Disconnect aileron cables
- Disconnect pitot line
- Disconnect flap pushrods
- Remove safety rings from lift strut bolts
- Remove nuts from lift strut bolts and spar bolts
- Support wing tip
- Remove lift struts
- Remove spar bolts (wing root)
- Slide wing outwards until spar is clear of cabin.

7.3 The tail plane is not designed to be a regular de-rig item, however it may be removed for long distance trailering, as may the rudder. When re assembling these parts replace all Nyloc nuts that were removed for disassembly.

8. Weight and Balance

8.1 So long as it is kept within the placarded operating limits, and no unapproved modifications have been made since construction (including the alteration of ballast), the Skyranger can be flown with any permitted fuel, pilot and passenger weights without falling outside of its permitted CG limits. However, pilots should be aware that stick forces and displacements will become lighter with aft CG (typically a heavy crew and full fuel) and heavier with forward CG (typically low fuel, light pilot only). Also at aft Cg, the hands off stability will be reduced. The aircraft will have an increased tendency to lower damping in Phugoid motion (hunting in speed and height when disturbed), which will be most noticeable in turbulent conditions. Flying outside of the permitted CG limits at either extreme is potentially dangerous and should not be attempted in any circumstance.

8.2 **CG Datum** The Skyranger CG datum is at the main wheel axles centreline. Measurements are in metres and kg.

8.3 **CG moment arms.** The moment arms of the seats, fuel tank(s) and other items are shown in the Weight and CG report at Annex C.

8.4 **Weighing.** The Skyranger will have been weighed when first built, and must be re-weighed at intervals as laid down by the BMAA and CAA (typically every 5 years or when it is modified or repaired).

8.4.1 Weighing should be carried out by a BMAA 3-axis inspector or Technical Team member. A copy of the W&CG report must be retained in this manual at Annex C. Also at each weighing, details of the weighing must be entered in the aircraft logbook. Full instructions on how to weigh a microlight aircraft are contained in BMAA technical information leaflet TIL 012, and specifically for the Skyranger in HADS HM4.

9. Routine Maintenance

9.1 The aircraft is to be maintained to Microlight Maintenance Schedule MMS-1, which is contained in BMAA Technical Information Leaflet 020. Engine maintenance should be in accordance with the engine maintenance manual.

9.2 **The following additional points are required during routine airframe maintenance and inspection:**

- When inspecting control runs it is good practice to rotate pulleys 90^0 to reduce wear spots.
- If a wood hub propeller is fitted, check securing bolts for tightness after seasonal changes in temperature and humidity in addition to the check C period.
- When checking control runs check the forward attachment of the aileron torque tube. This has a 6mm bolt acting as pivot for the primary aileron drive horn. This will be subject to wear over time. Grasp the torque tube at the forward end and test for excessive wear by moving up and down.

9.3 **The following exceptions are made to MMS-1 in the maintenance and inspection of the Skyranger:**

- Wing battens should not be removed to check profile. An external template of batten profile can be made on stiff card or plastic and shape can be checked by lying the template externally over the battens whilst still in place.
- It should not be necessary to remove fuselage covering to inspect the rear fuselage structure.
- Do not clean spark plugs. Simply replace when they have reached their specified life.

9.4 **Component life / major inspections.**

9.4.1 It is recommended that after 1000 hours or 5 years that the Skyranger should be subject to a major strip down inspection. This inspection should include the following points:

- All elements of MMS-1 annual check
- Removal of covering (exception may be made for painted coverings)
- Replacement of leading and trailing edge spar to fuselage securing bolts
- Replacement of the bolts that attach the leading and trailing edge securing U channel to the fuselage structure.
- Replacement of the lift strut securing bolts (see para 9.4.4 for specific life)
- Replacement of all fastenings exhibiting corrosion or significant wear
- Detailed inspection of all airframe components for distortion, corrosion and wear. Replace where required.
- Detailed inspection of all critical bolted joints for movement and cracking of holes.

9.4.2 **Elevator cables** should be regularly inspected for wear at the point where they pass through the pulleys behind the control stick. They must be replaced either on condition or at a maximum of 500 hours.

9.4.3 **All other control cables** should be changed on condition or at a maximum of 1000 hours.

9.4.4 **Lower lift strut bolts** must be changed at a maximum of 500 hours, due to fatigue life analysis.

9.4.5 **Aileron torque tube forward pivot bolt** Over time this will wear the aluminium aileron horn that pivots around it. This assembly should be dismantled at 500 hours for detailed inspection. Replace the horn and bolt if excessive wear is present.

9.5 Items to inspect following a heavy landing

- Check front landing gear for straightness, including distortion of lower support sleeve and brackets.
- Check main landing gear legs for symmetry, including wheel angles. The wheels should be at or near an upright angle.
- Check main cross beam TU9 for straightness
- Check the rear fixing of lower cabin side tube TU16 for distortion / cracking of U bracket.
- Check landing gear drag link end fixings for distortion and play.
- Stand in front of the aircraft some distance ahead and check overall symmetry of structure.
- Apologise to the aeroplane, go for a beer and think how to avoid such a landing again – but don't fly again until the next day!

10. Repairs

10.1 **General.** Repairs should either be carried out as described below, or to a scheme approved by the BMAA. After repairs, you should always obtain a "second inspection" from a qualified pilot or (preferably) BMAA inspector after making any repair, who should sign in the logbook that they have inspected the repair and consider it safe. Where this is not possible, draw the repair to the attention of your inspector at the next permit renewal who should oversign your own entry.

10.2 **Sail Repairs.** Sail (flexible surface) repairs must be carried out in accordance with BMAA Technical Information Leaflet TIL 015.

10.3 **Repairs to tubular structure, springs, pulleys, cables, bolts, nuts, etc.** Any such damaged parts must not be repaired and the aircraft must not be flown once the damage has been identified. Identical replacement parts must be fitted before any further flight, and their installation inspected and signed-off in the logbook by a BMAA inspector. The invoice (legally referred to as the certificate of conformity) for the parts fitted must kept with the aircraft logbook. If it is not possible to obtain replacement parts, consult the BMAA Technical Office for advice.

10.4 **Repairs to the Engine.** These should be carried out in accordance with the maintenance manual for the engine fitted.

10.5 **Repairs to Instruments.** Microlight aircraft instruments are not usually repairable and should be replaced.

10.6 **Repairs to Fuel Hose.** Any fuel hose which is found to be cracked or damaged must not be repaired. Replace it with at least automotive quality (preferably aircraft or fire-retardant boat use) reinforced rubber fuel hose. It is not advised that transparent fuel hose is used, and PVC hose must not be used with fuel under any circumstances. Take care not to over-tighten cable ties used to secure hose, since this can cause a flow restriction.

10.7 **Damaged Wiring.** Replace with fireproof or fire resistant wiring of the same or higher current rating, secured in the original manner.

10.8 **Repairs to Batteries.** A damaged battery must be replaced and all surrounding structure thoroughly inspected for acid damage.

10.9 **Repairs to Tyres.** An inner tube puncture may be repaired. If there is damage to the tyres which shows the inner canvas, replace the tyre in question.

10.10 **Damage to the Fuel Tank.** The fuel tank should be drained and removed from the aircraft. The fuel tank should be replaced.

11. Vital Statistics

Weight values for this Skyranger are at Annex C and a description of the aircraft is at section 2. However the following describes the basic dimensions of the aircraft:-

Length	5.72m
Height	2.4m
Span	9.5m
Mean chord	1.5m
Wing area	14.1m2
Dihedral angle	1.2^0
Sweepback angle	0^0
Washout	1^0
Fin area	0.4m2
Rudder area	0.46m2
Horizontal tailplane area	1.08m2
Elevator area	0.92m2
Aspect ratio	6.33
Undercarriage track width	1.6m
Undercarriage wheelbase	1.4m
Fuel capacity	50l
Tyre Pressure	26psi

ANNEX A

MAAN RECOMMENDING ISSUE OF A PERMIT TO FLY

The approval MAAN for this aircraft is to follow this page.

ANNEX B

ENGINE MANUAL

The operators and maintenance manual for the engine fitted to this aircraft is to follow this page.

Annex C

MAINTENANCE SCHEDULE

The BMAA maintenance schedule MMS-1 is to follow this page.

Annex D

WEIGHT AND BALANCE REPORT

Forms BMAA/AW/028 completed for this aircraft are to follow this page.

Annex E

MINOR MODIFICATIONS FITTED TO THIS AIRCRAFT SINCE INITIAL PERMIT ISSUE

Minor modification approval sheets are to follow this page

Minmod No.	Description	Sign and date incorporated

Annex F

MAJOR MODIFICATIONS FITTED TO THIS AIRCRAFT SINCE INITIAL PERMIT ISSUE

BMAA MAANs and CAA AANs (other than the original approval MAAN) are to follow this page.

MAAN / AAN No.	Issue	Description	Sign and date incorporated

Annex G

INSTRUCTIONS AND MANUALS FOR OTHER DEVICES FITTED TO THIS AIRCRAFT

No.	Description	Issue or date	Approval Mod No., or original equipment
F1			
F2			
F3			
F4			
F5			
F6			
F7			
F8			
F9			
F10			
F11			
F12			
F13			
F14			
F15			
F16			
F17			